

# Baby Bella's Quest: Optimal Paws-itioning in a Grid World

## ECE 595: Reinforcement Learning

October 22, 2023

In this project, you will implement the value iteration algorithm to find the optimal value function for a simple grid world environment. The goal is to help an agent navigate this grid to reach a specified terminal state while avoiding obstacles. Your implementation should include the following components:

- Create a 2D grid world with specified dimensions where the agent can move in four directions: up, down, left, and right. The grid should contain cells that are either "empty" or "blocked," and the agent's goal is to reach a specific terminal state.
- Implement the value iteration algorithm to find the optimal value function for this grid world. You can use a discount factor ( $\gamma$ ) of your choice.
- Display the grid world with obstacles and the optimal value function for each state in the grid (after convergence).
- Create a graph that shows how the value function changes over iterations during the value iteration process. The x-axis should represent the number of iterations, and the y-axis should represent the value function. Analyze the convergence behavior.

\*For students who want to experiment more, you can add extensions to the project, such as introducing a stochastic environment, varying the goal positions, or exploring different discount factors.